

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 8-10, 13 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Hahn (European Patent No. EP 1209332).

Regarding claim 8, Hahn is drawn to a method for regenerating a nitrogen oxide storage catalytic converter arranged in the exhaust pipe of an internal combustion engine. Hahn discloses in a first regeneration mode, setting a constant value for an air/fuel ratio ($\lambda F1$, Figure 4) when nitrogen oxide concentration in exhaust gas on an output side of the converter exceeds a predeterminable triggering threshold value, which triggers a regeneration of the nitrogen oxide storage catalytic converter (Figure 1; paragraphs 0007 and 0025). Hahn also discloses after the first regeneration mode implementing a second regeneration mode in which a variable value is provided for the air/fuel ratio ($\lambda F2$ - $\lambda F4$, Figure 4), such that the time rate of change of the air/fuel ratio is set as a function of one of i) mass flow of the exhaust gas flowing through the storage catalytic converter, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas (paragraphs 0024-0027 and 0029).

Regarding claim 9, Hahn further discloses ending the first regeneration mode after a predeterminable first period of time (Figure 4, paragraph 0029).

Regarding claim 10, Hahn further discloses ending the second regeneration mode after a predeterminable second period of time (Figure 4, paragraphs 0029-0031).

Regarding claim 13, Hahn further discloses setting of the air/fuel ratio is limited to a value range with a predeterminable lower value and a predeterminable upper limit value (paragraphs 0028 and 0031).

Regarding claim 14, the Examiner notes the use of the phrase "and/or" by the Applicant. For examination purposes, "and/or" is treated as "or" under the broadest reasonable interpretation of the claim. As noted above, Hahn discloses a predeterminable triggering threshold value, which triggers a regeneration of the nitrogen oxide storage catalytic converter (Figure 1; paragraphs 0007 and 0025).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hahn as applied to claim 8 above.

Regarding claim 11, Hahn discloses multiple regeneration modes (Figure 4 and paragraphs 0028-0030). As noted above, Hahn discloses a regeneration mode in which a variable value is provided for the air/fuel ratio ($\lambda F2$ - $\lambda F4$, Figure 4), such that the time rate of change of the air/fuel ratio is set as a function of one of i) mass flow of the exhaust gas flowing through the storage catalytic converter, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas (paragraphs 0024-0027 and 0029). Hahn further discloses that oxygen sensitive measuring means 20 may be disposed in the exhaust pipe 14 on the output side of a nitrogen oxide storage converter 18. The oxygen sensitive measuring means 20 may be a NO_x sensor which includes a lambda measuring function. (Figure 1; paragraphs 0021 and 0024). Hahn further discloses that the time rate of change of the air/fuel ratio may be set as a function of a measured value of the lambda measuring function of the NO_x sensor 20. (paragraph 24).

Hahn discloses the claimed invention except for a third regeneration mode, setting the time rate of change of the air/fuel ratio as a function of one of i) the mass flow of the exhaust gas, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas, **and also as** a function of a measured value from a lambda probe arranged in the exhaust pipe on the output side of the nitrogen oxide storage catalytic converter.

A person of ordinary skill in the art at the time the invention was made would have been motivated to modify Hahn to include a regeneration mode setting the time rate of change of the air/fuel ratio as a function of one of i) the mass flow of the exhaust gas, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas, **and also as** a function of a measured value from a lambda probe arranged in the exhaust pipe on the output side of the nitrogen oxide storage catalytic converter. This motivation occurs because Hahn discloses setting the time rate of change of the air/fuel ratio as a function of one of i) the mass flow of the exhaust gas, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas, or as a function of a measured value from a lambda probe arranged in the exhaust pipe on the output side of the nitrogen oxide storage catalytic converter to minimize fuel consumption while efficiently and completely regenerating the NO_x storage catalytic converter. Modifying Hahn to set the time rate of change of the air/fuel ratio as a function of one of i) the mass flow of the exhaust gas, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas, **and also as** a function of a measured value from a lambda probe arranged in the exhaust

pipe on the output side of the nitrogen oxide storage catalytic converter would further enhance the minimization of fuel consumption while efficiently and completely regenerating the NOx storage catalytic converter, the stated purpose of Hahn. Further, this can easily be accomplished through the oxygen sensitive measuring means 20, which may include both a NOx sensor and a lambda measuring function.

Allowable Subject Matter

6. Claim 15 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments, filed December 8, 2010, with respect to the 103(a) rejection of claims 8-10, 13 and 14 in view of Gunther and Voigtlaender have been fully considered and are persuasive. The 103(a) rejection of claims 8-10, 13 and 14 has been withdrawn.

8. Applicant's arguments with regard to the 102(a) and 103(a) rejection of claims 8 - 14 in view of Hahn have been fully considered but they are not persuasive.

9. The applicant states that Hahn fails to disclose a second regeneration mode in which a variable value is provided for the air/fuel ratio such that the time rate of change of the air/fuel ratio is set as a function of one of i) mass flow of the exhaust gas flowing

through the storage catalytic converter, and ii) an internal combustion engine operating variable linked with the mass flow of the exhaust gas.

10. However, in the response filed December 8, 2010, the applicant admits that Hahn discloses "setting a variable value for an air/fuel ratio λ_M of an air/fuel mixture burned in the engine" (page 6, lines 22 - 24 of the December 8, 2010 response) and that "Figure 4 of the Hahn et al. document shows . . . and a second regeneration phase with a variable λ_M (λ_{F2} , λ_{F3} , λ_{F4} ; t_{AH} - t_E)" (page 7, lines 8- 10 of the December 8, 2010 response).

11. Further, the applicant admits in discussing Hahn that "it is conceivable to conclude that the λ_M value depends on the later, and also that the time rate of change $d\lambda_M/dt$ of the air/fuel ratio λ_M depends on the mass flow of the exhaust gas" (emphasis added) (page 7, lines 3 - 4 of the December 8, 2010 response) and that "it could possibly be concluded that the time rate of change $d\lambda_M/dt$ of the air/fuel ratio λ_M is set as a function of mass flow of the exhaust gas flowing through the NSC" (page 7, lines 6 - 8 of the December 8, 2010 response).

12. Accordingly, as the applicant admits that Hahn discloses all of the elements of independent claim 8, the 102(a) rejection of claims 8 - 10, 13 and 14 in view of Hahn and the 103(a) rejection of claims 11 and 12 in view of Hahn is maintained.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Shanske whose telephone number is 571-270-5985. The examiner can normally be reached on Monday through Friday 8:30am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Denion can be reached on 571-272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jason Shanske/
Art Unit 3748

/Thomas E. Denion/
Supervisory Patent Examiner, Art Unit 3748
